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## TOR: a new orphan receptor expressed in the thymus that can modulate retinoid and thyroid hormone signals.

Ortiz MA, Piedrafita FJ, Pfahl M, Maki R  
Mol Endocrinol 1995 Dec 9:1679-91

BROWSE : [Mol Endocrinol](#) • [Volume 9](#) • [Issue 12](#)

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### Abstract

Vitamin A and other fat-soluble hormones and vitamins have important roles as modulators of essential biological processes such as homeostasis, development, differentiation, and oncogenesis and also as regulators of the immune system. The active form of vitamin A, retinoic acid, as well as vitamin D3 and thyroid hormones exert their actions by binding to specific nuclear receptors that represent one subfamily of the steroid/thyroid hormone receptor superfamily. To identify new members of the retinoid/thyroid hormone receptor subfamily that could play a role in the immune system, a screening of a T cell cDNA library was performed using a retinoid X receptor probe. A clone was isolated encoding a novel nuclear receptor expressed mainly in the thymus and T cell lines. This new receptor, TOR (thymus orphan receptor), is most closely related in both its DNA-binding domain and ligand-binding domain, 90% and 53%, respectively, to ROR alpha/RZR alpha and clusters with these two receptors and RZR beta in a phylogenetic tree, when both the DNA-binding domain and the ligand-binding domain sequences of nuclear receptors are compared. Thus, TOR is part of a subgroup of receptors, one of which has recently been reported to be activated by melatonin. TOR binds specifically to a direct repeat of the half-site sequence 5'-AGGTCA-3' with a four- or five-nucleotide spacer, DNA sequences that also serve as binding sites for thyroid hormone (TR), and retinoic acid receptors (RAR). In transient transfection experiments TOR does not activate a reporter gene carrying these sequences in the absence or the presence of any known nuclear receptor ligands. TOR, however, is able to repress TR and RAR activity on DR-4-TREs or DR-5-RAREs, respectively. Therefore, our data suggest that TOR, similar to COUP-TF, can negatively regulate retinoic acid and thyroid hormone signals. However, the response elements recognized by TOR and COUP-TF differ as do the expression patterns of these receptors. Thus, one important role of TOR could be to modulate retinoid and thyroid hormone signals in the thymus.

### MeSH

-continued

(B) TYPE: nucleic acid  
(C) STRANDEDNESS: single  
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA  
(A) DESCRIPTION: hIL-4/R121I

(iii) HYPOTHETICAL: no

(iv) ANTI-SENSE: no

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 8:

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GCA TGT GCC GGC AAC TTT GTC CAC GGA CAC AAG TGC GAT ATC ACC	90
Ala Cys Ala Gly Asn Phe Val His Gly His Lys Cys Asp Ile Thr	
20 25 30	
TTA CAG GAG ATC ATC AAA ACT TTG AAC AGC CTC ACA GAG CAG AAG	135
Leu Gln Glu Ile Ile Lys Thr Leu Asn Ser Leu Thr Glu Gln Lys	
35 40 45	
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Thr Leu Cys Thr Glu Leu Thr Val Thr Asp Ile Phe Ala Ala Ser	
50 55 60	
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Lys Asn Thr Thr Glu Lys Glu Thr Phe Cys Arg Ala Ala Thr Val	
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GGT GCG ACT GCA CAG CAG TTC CAC AGG CAC AAG CAG CTG ATC CGA	315
Gly Ala Thr Ala Gln Gln Phe His Arg His Lys Gln Leu Ile Arg	
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Phe Leu Lys Arg Leu Asp Arg Asn Leu Trp Gly Leu Ala Gly Leu	
110 115 120	
AAT TCC TGT CCT GTG AAG GAA GCC AAC CAG AGT ACG TTG GAA AAC	405
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125 130 135	
TTC TTG GAA AGG CTA AAG ACG ATC ATG ATA GAG AAA TAT TCA AAG	450
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140 145 150	
TGT TCG AGC TAG	462
Cys Ser Ser End	
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(2) INFORMATION FOR SEQ ID NO: 9:

(i) SEQUENCE CHARACTERISTICS:  
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(B) TYPE: nucleic acid  
(C) STRANDEDNESS: single  
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA  
(A) DESCRIPTION: hIL-4/R121K

(iii) HYPOTHETICAL: no

(iv) ANTI-SENSE: no

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 9:

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Met Gly Leu Thr Ser Gln Leu Leu Pro Pro Leu Phe Phe Leu Leu	
1 5 10 15	
GCA TGT GCC GGC AAC TTT GTC CAC GGA CAC AAG TGC GAT ATC ACC	90